

2. An apparatus as in claim 1 wherein the input that receives a digital signal to be transmitted comprises a Gigabit Media Independent Interface (GMII).
3. An apparatus as in claim 1 wherein the input that receives a digital signal to be transmitted further comprises a control input that controls the number of bits of the digital signal to be transmitted which are provided to each modulator.
4. An apparatus as in claim 1 wherein each programmable modulator further comprises a control input that controls the type of modulation that is applied to the portion of the digital signal that is accepted by each modulation.
5. An apparatus as in claim 4 wherein the type of modulation selected consists essentially of binary phase shift keying (BPSK), quadrature phase shift keying (QPSK), and quadrature amplitude modulation (QAM).
6. An apparatus as in claim 1 wherein the mixer frequency that is provided to the mixer is a programmable frequency.
7. An apparatus as in claim 1 wherein each bandpass filter has a programmable bandpass.
8. An apparatus as in claim 1 wherein the apparatus is integrated within a single integrated circuit.
9. An apparatus as in claim 8 wherein the single integrated circuit is a complementary Metal Oxide Semiconductor (CMOS) integrated circuit.
10. An apparatus for receiving data from a fiber channel the apparatus comprising:
an input that receives a wide band signal;

a plurality of mixers that accept the wideband signal and mix it with a mixer frequency;

a plurality of low pass filters that filter the outputs of the mixers;

a plurality of programmable demodulators each accepting the output of one of the mixers and demodulating said mixer output thereby providing a demodulated digital output; and

a combiner circuit for combining the demodulated digital outputs from the plurality of programmable demodulators into at least one digital data stream.

11. An apparatus as in claim 10 wherein the mixer frequency is a programmable frequency.

12. An apparatus as in claim 10 wherein the plurality of low pass filters have programmable bandwidth.

13. An apparatus as in claim 10 wherein the programmable demodulators further comprise a control input that controls the type of demodulation applied to the signal accepted from the mixer.

14. An apparatus as in claim 13 wherein the type of modulation selected consists essentially of BPSK, QPSK, and QAM.

15. An apparatus as in claim 10 wherein the combiner circuit comprises a XGMII.

16. A method for transmitting data on a fiber optic channel, the method comprising:
providing a test signal to a fiber optic channel;
receiving a characterization of the channel defined by the channel response to the test signal;
programming a multicarrier modulator corresponding to the characterization of the channel.

17. A method as in claim 16 wherein providing a test signal to a fiber optic channel further comprises providing an intensity modulated light source wherein the intensity changes according to a frequency sweep signal, but the maximum and minimum intensity does not change.

18. A method as in claim 16 wherein programming a multicarrier modulator further comprises selecting a type of modulation for a plurality of modulators, wherein each modulator corresponds to a modulation of one of a multicarrier signals.

19. A method as in claim 16 wherein programming a multicarrier modulator further comprises providing a plurality of selected mixer frequencies to a plurality of mixers, wherein the mixers determine the carrier frequencies for the multicarrier modulator.

20. A method as in claim 19 further comprising programming a bandpass filter with a center frequency corresponding to the mixer frequency of the mixer which provides a signal to the bandpass filter.

21. A method as in claim 20 further comprising selecting the bandwidth of a plurality of bandpass filter depending on the modulation of the signal being filtered by each bandpass filter.

22. An apparatus as in claim 1 further comprising a plurality of convolutional coders disposed between the input and at least one of the plurality of programmable modulators and accepting a portion of the signal to be transmitted from the input and performing a convolutional coding on the accepted signal thereby providing a convolutionally coded output to the at least at least one of the plurality of programmable modulators.

23. An apparatus as in claim 10 further comprising:
at least one demodulator providing soft decisions as an output;

at least one trellis decoder that accepts soft decisions from the at least one demodulator and provides a trellis decoding of the soft outputs and provides a hard decision to the combiner output.

24. An apparatus for transmitting data on a fiber channel the apparatus comprising:
an input that receives a digital signal to be transmitted;
a convolutional coder disposed between the input and at least one symbol encoder;
a plurality of symbol encoders that accept a portion of the signal received by the input, and encode the input into a symbol (S) and a complex conjugate of the symbol (S^*);
a 32-inverse fast Fourier Transformer (32-IFFT) that receives S and S^* signals and provides a digital output signals;
a plurality of D/A converters for accepting the digital outputs from the 32-IFFT and for converting the accepted digital value to an analog value; and
an analog multiplexer that samples the analog outputs from the plurality of digital to analog converters and combines them into an interleaved signal having successive values representative of the output of the plurality of digital to analog converters.

25. An apparatus for receiving data on a fiber channel the apparatus comprising:
an input that accepts an interleaved signal comprising a plurality of discrete successive values;
a plurality of sample and hold circuits that accept the interleaved signal and extract a sample comprising a discrete value;
a plurality of analog to digital converters that convert the discrete values from the plurality of sample and hold circuits to a plurality of digital values;
a 32 Inverse Fourier Transform circuit that accepts said plurality of values from the plurality of analog to digital converters and converts said values into symbols (S) and complex conjugates of the symbols (S^*);
a plurality of trellis decoders that accept said symbols (S) and said complex conjugates of the symbols (S^*) and produced an uncoded output; and
an interface which accepts the outputs of said plurality of trellis decoders and combines them into a digital signal.

26. A method of transmitting a first parallel data stream over a fiber optic channel, comprising:

converting the first parallel data stream into a plurality of second parallel data

streams;

parallel process converting the plurality of parallel data streams into a plurality of

analog signals;

combining the plurality of analog signals into a single analog signal;

converting the single analog signal into an optical signal; and

coupling the optical signal to the fiber optic channel.

27. A method as in claim 26 wherein the parallel process converting the plurality of second parallel data streams into a plurality of analog signals further comprises:

encoding the plurality of second parallel data streams into symbols in a plurality of symbol encoders;

converting the symbols into a plurality of transformed values in an inverse Fast Fourier transformer; and

converting the transformed values into analog representations in a plurality of digital to analog convertors.

28. A method as in claim 26 wherein the parallel process converting the plurality of second parallel data streams into a plurality of analog signals further comprises:

modulating the second parallel data streams in a plurality of modulators;

mixing the modulated signals in a plurality of mixers; and,

filtering the mixed signals in a plurality of band pass filters.

29. A method as in claim 26 wherein the converting the first parallel data stream into a plurality of second parallel data streams comprises accepting the first parallel data stream from an interface selected from the interfaces consisting of a ten gigabit media independent interface (XGMII) and a ten gigabit extended Attachment Unit Interface (XAUI).

30. A method of converting an optical signal received from a fiber optic channel into a parallel data stream, comprising:

converting the optical signal received from the fiber optic channel into an analog electrical signal;

converting the analog electrical signal into a plurality of baseband signals; and

converting the plurality baseband signals into a parallel data stream.

31. A method as in claim 30 wherein the parallel process converting the analog electrical signal into a plurality of baseband signals comprises mixing the analog electrical signal with a plurality of mixing frequencies to produce a plurality of baseband signals.

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32. A method as in claim 31 wherein the parallel process converting the analog electrical signal into a plurality of baseband signals comprises mixing the analog electrical signal with a plurality of mixing frequencies to produce a plurality of baseband signals further comprises filtering the plurality of signals mixed with the plurality of mixing frequencies to produce a plurality of baseband signals;

33. A method as in claim 30 wherein the parallel process converting the analog electrical signal into a plurality of baseband signals comprises:

the converting the analog electrical signal into a plurality of symbols in a Fast Fourier transformer; and

decoding the plurality of symbols in a plurality of decoders to produce a parallel data stream.

34. A method as in claim 30 wherein the converting of the analog electrical signal into a plurality of baseband signals further comprises:

sampling and holding successive values of the analog electrical signal;

providing the held analog values to a plurality of A/D converters; and

converting the held values to a plurality of baseband signals.

35. A method as in claim 30 wherein the parallel process converting of the analog electrical signal in a plurality of baseband signals further comprises:

sampling and holding successive values of the analog electrical signal;
providing the held values to a single A/D converter; and
converting the held values to a plurality of baseband digital signals.

36. A method as in 34 wherein the converting of the held values to a plurality of baseband signals further comprises time interleaving the converting of the held values.

37. A method of transmitting and receiving a first parallel data stream over a fiber optic channel, comprising:

converting the first parallel data stream into a plurality of second parallel data streams;

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ans. x parallel process converting the plurality of second parallel data streams into a plurality of analog signals;

combining the plurality of analog signals into a single analog signal;

converting the single analog signal into an optical signal;

coupling the optical signal onto the fiber optic channel;

converting the optical signal received from the fiber optic channel into an analog electrical signal;

parallel process converting the analog electrical signal into a third plurality of parallel digital signals; and

converting the third plurality of parallel digital signals into a fourth parallel data stream.

38. A method of converting an optical signal received from a fiber optic channel, comprising:

converting the optical signal received from the fiber optic channel into an analog electrical signal;

providing the analog electrical signal to a plurality of A/D converters; and

converting the analog electrical signal to a plurality of digital signals.